951,769.

F. E. MESTA.

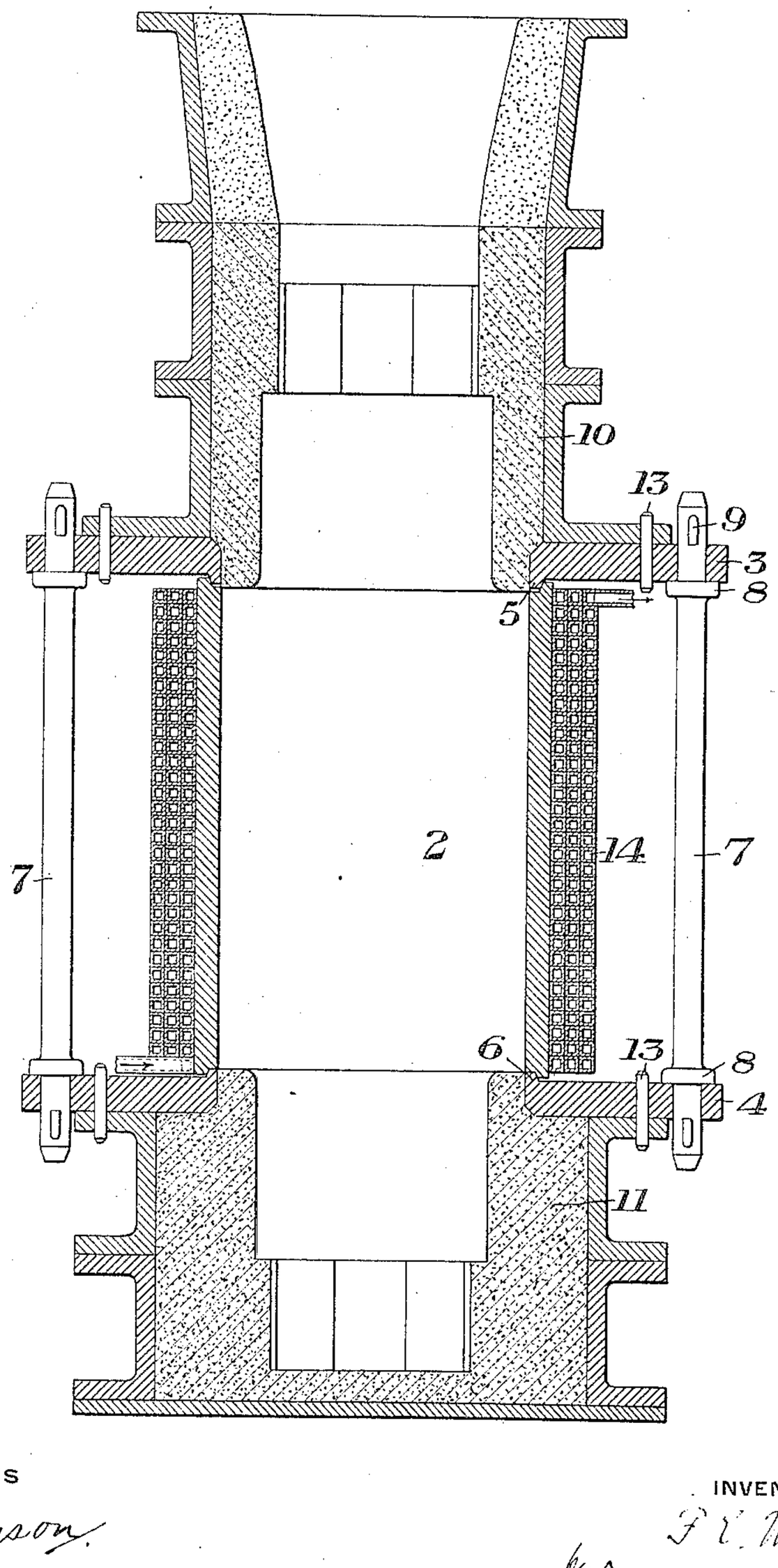
MOLD FOR CHILLED ROLLS.

APPLICATION FILED JAN. 16, 1908.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

R. A. Balderson.

W. W. Swartz

INVENTOR

F. E. Mesta.

by Dallett Byrnes & Parmelee

his attys

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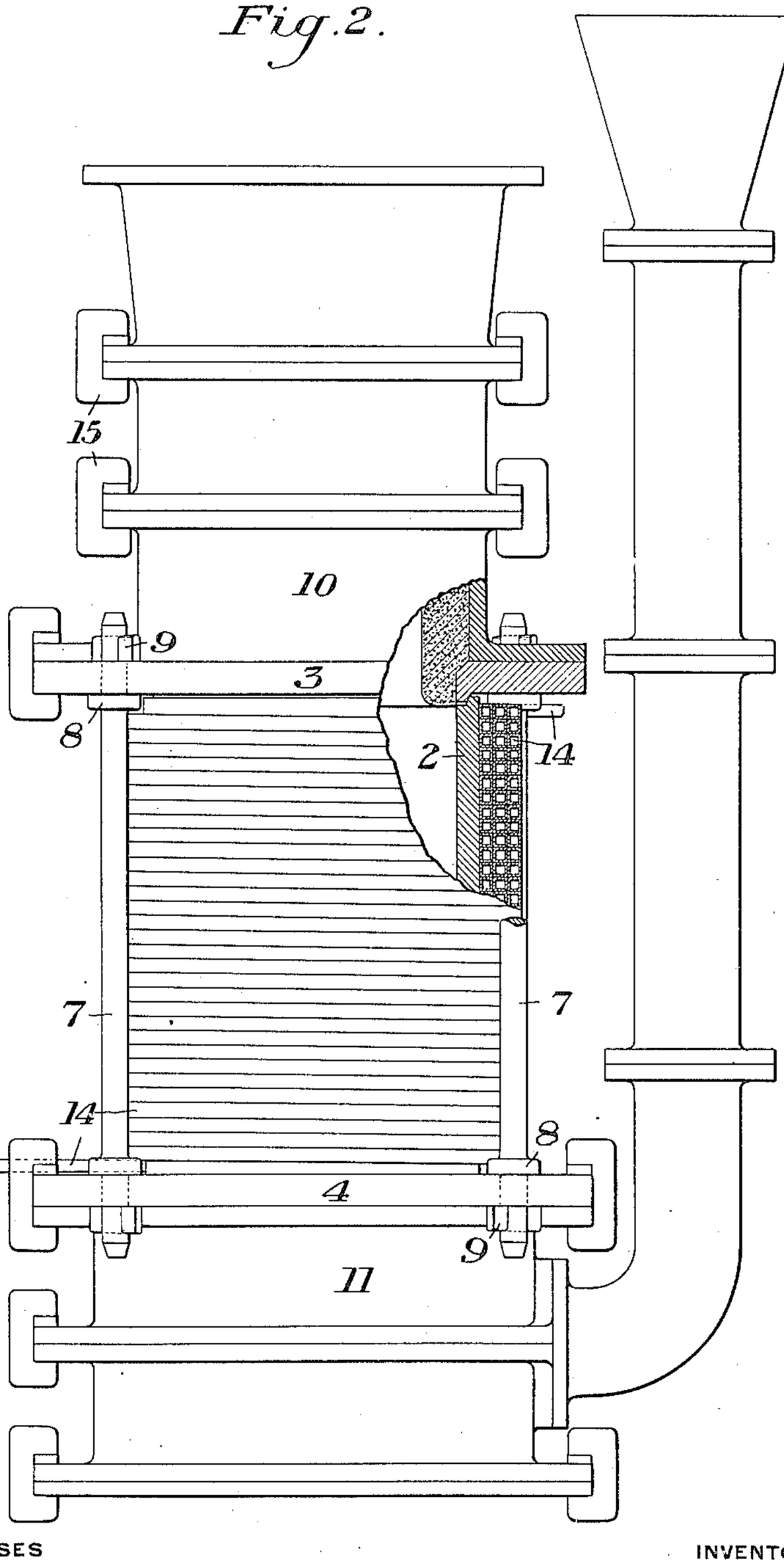
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

FREDERICK E. MESTA, OF WEST HOMESTEAD, PENNSYLVANIA, ASSIGNOR TO MESTA MACHINE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

MOLD FOR CHILLED ROLLS.

951,769. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed January 16, 1908. Serial No. 411,082.

To all whom it may concern:

Be it known that I, FREDERICK E. MESTA, of West Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Molds for Chilled Rolls, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central vertical section of a mold constructed in accordance with my invention; and Fig. 2 is a side elevation of the same, partly broken away.

My invention relates to the manufacture of chilled rolls and similar articles of circular cross section, and is designed to provide an improved mold therefor.

Heretofore in the common method of making chilled rolls, the chill mold has always been made of cast iron, and the walls, or the thickness of the shell, has usually been made from one-fourth to one-third the diameter of the bore; that is, if the chill mold would be twenty-four inches inside diameter, the thickness of the wall would be from six to eight inches. This heavy wall, in the common practice of making chills, was not necessary to hold the strain of the hot metal but was made heavy in order to absorb the heat of the liquid iron when poured in the mold, thus forming the chill. With this heavy wall, the total expansion of the mold is small, and also very slow; therefore, the metal in the mold would commence to contract while the heavy walls of the mold are still expanding, thus leaving a space between the mold and the roll soon after the metal is poured, which retards the chilling and also very often makes uneven chills.

My invention is designed to increase the depth of chill obtained with a certain grade of iron, thus enabling me to obtain the same depth of chill with a lower grade of chilling iron having a lower carbon, and consequently greater toughness and tensile strength and less expansion and contraction. It is also designed to give an even and uniform chill.

In carrying out my process, I employ a comparatively thin metal mold or chill, and I positively extract the heat from the molten metal by applying a cooling medium to the outer surface of the chill. Moreover, by using a thin chill, the expansion will take place almost immediately after the pouring of the metal, so that the outer shell of the chilled roll will not be formed until the chill mold has expanded to substantially its entire amount. By applying a positive cooling medium to the thin chill mold, during the setting of the metal, I not only extract the heat from the molten metal, thus being able to get the depth of chill required, but also keep contracting the thin chill so that it is always in perfect contact with the roll until the chill is formed, and by this means always makes the chill even.

In the drawings, in which I show one form of apparatus for carrying out my invention, 2 represents the chill mold proper, which consists of a metal cylinder finished comparatively smooth, inside by machining, and which is preferably thin, relatively to the chill molds now employed. The chill mold may be made of cast iron, cast steel, wrought steel, or other suitable metal, and should be adapted to conduct different temperatures therethrough rapidly. This chill or ring is preferably held in a vertical position by circular top and bottom plates 3 and 4, having central holes provided with flanges 5 and 6, which fit into corresponding recesses in the ends of the chill mold, thus forming slip joints which hold the mold vertically while allowing it to freely expand and contract. Through these plates extend bolts 7, which are preferably provided with integral collars 8, serving to space apart the plates and secure the cope. These bolts are made of the proper length and are preferably held by keys 9.

The cope 10 and drag 11 may be held in position by suitable dowel pins 13, engaging the cope and drag flanges and the top and bottom mold plates. Around the chill mold, I wind in helical form a flexible metal pipe 14, this being preferably made in a series of overlying coils of which I have shown three, though any desired number of coils may be used. This elastic spring coil is employed for the circulation of a cooling medium, such as water, brine, or ammonia gas.

In carrying out the process, the cope and drag having been molded in sand in the usual manner and the parts having been

assembled, as shown in the drawings and held by suitable clamps, as shown at 15, the metal is poured in, in the ordinary manner. Immediately after pouring, the cooling medium is circulated through the circulating coils of tubing, preferably entering the innermost coil first and being taken away from the other end of the outer coil, thus positively extracting heat from the chill mold or forcing a cooler temperature thereinto. The forcing of a cooler temperature should begin at least as early as when the chill mold has expanded after the metal is poured in, and as this moment can not be determined exactly, I prefer to start the flow of fluid immediately after pouring. The circulation of the cooling fluid is preferably maintained until the chill mold has contracted to its normal diameter. At this time, I preferably shut off the flow of cooling medium and the metal then begins to heat up slowly while the chilled roll is contracting away from it to the slight amount which is necessary in order to draw the roll. This gradual heating up action of the chill mold acts to anneal the chill and impart strength to the roll. The roll may then be taken out in the ordinary manner. If desired, the mold may be artificially heated before pouring, in order to insure the desired expansion of the mold.

The advantages of my invention will be apparent to those skilled in the art. Owing to the positive extraction of heat by applying a cooling medium to the thin conducting chill ring, I can greatly increase the depth of chill with iron having a given amount of carbon, and can keep the mold in contact with the roll during the chilling action. Consequently, I can obtain the desired depth of chill with a less percentage of carbon in the iron, and hence, can use a better grade of iron which will produce a tougher roll having greater tensile strength. The coiled pipe acts to expand and contract under the action of the chill mold to accommodate itself to the different diameters thereof, while at the same time, continuously extracting heat therefrom, owing to the circulation of the cooling medium. Whereas in an ordinary chill, the chilling effect of the mold is constantly decreasing as it heats up, I avoid this in my mold and force the chill into the iron of the roll through any desired period, irrespective of the amount of heat conducted to the chill mold.

An even uniform chill is insured by my simple method which enables a very simple apparatus to be used. The comparatively thin chilling ring or mold shrinks as fast or faster than the metal of the roll, and thus follows up the roll and maintains contact with it under the pressure of the shrinkage caused by the cooling coils. The chill is so proportioned as to thickness, that when it is cooled to its normal size, the roll will have sufficient further contraction to release it from the mold, and preferably so that it expands to substantially the same amount as the metal of the roll contracts. There is no complication due to the use of wings or separated segments on chill rings, and a much better article is produced by reason of the actual and forcible extraction of heat. Owing to the very rapid chilling and setting of the metal circumferentially, the feed from the sink head into the body of the roll is more complete and the roll is less liable to have blow-holes and spongy portions in the neck and wabbler.

The invention is equally applicable to chilled car wheels or to the chilling of any other articles of circular cross section.

The mold may be made in one piece, as shown, or in two or more transversely divided sections and is preferably made of cast or rolled steel, or other material having a greater coefficient of expansion and contraction than cast iron.

The cooling medium may be applied to its exterior in different manners, though I prefer the one shown, and many other variations may be made without departing from my invention.

I claim:

1. A chill mold for casting articles of chilled iron, having surrounding separated fluid conduits and in exterior contact with the chill, and means for circulating a cooling medium through said separated conduits, substantially as described.

2. A chill mold for casting chilled iron articles, having an elastic system of separated channels surrounding and exterior thereto, and arranged to allow free expansion and contraction of the chill, and means for circulating a cooling medium through the separated channels, substantially as described.

3. A chill mold for casting chilled iron articles, having separated exposed channels surrounding the exterior of the mold, thus providing separated bodies of water or cooling fluid, and means for circulating a cooling fluid through said channels, substantially as described.

4. A chill mold for casting chilled iron articles, having surrounding exposed channels formed of pipe in contact with the chill, and means for circulating a cooling medium through said pipes, substantially as described.

5. A chill mold for casting chilled iron articles, having a surrounding pipe coil in contact therewith, said pipe coil being external and exposed, substantially as described.

6. A chill mold for casting chilled rolls of greater length than diameter, said mold consisting of steel having a greater coeffi-

cient of expansion and contraction, and a higher melting point, than cast iron, substantially as described.

7. A chill mold for casting chilled rolls, of greater length than diameter, said mold consisting of steel having a greater coefficient of expansion and contraction, and a higher melting point than cast iron, and external cooling conduits surrounding said steel chill mold, substantially as described.

8. A chill mold of a proper length for casting chilled rolls, and consisting of steel having a greater coefficient of expansion and contraction than cast iron, and also having a higher melting point, and separated exposed fluid channels surrounding and in contact with the chill, substantially as described.

9. A solid chill mold having end-holding means arranged to allow free expansion and contraction, said chill having external exposed separated channels surrounding it for the circulation of a cooling medium, substantially as described.

In testimony whereof, I have hereunto set my hand.

F. E. MESTA.

Witnesses:
J. O. HORNING,
H. F. WAHL.